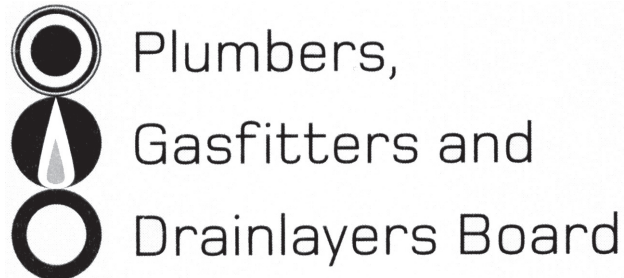


Affix label with Candidate Code  
Number here.  
If no label, enter candidate  
Number if known

.....

No. 9195



## REGISTRATION EXAMINATION, JUNE 2018

# CERTIFYING PLUMBER

QUESTION AND ANSWER BOOKLET

Time allowed **THREE** hours

### INSTRUCTIONS

Check that the Candidate Code Number on your admission slip is the same as the number on the label at the top of this page.

Do not start writing until you are told to do so by the Supervisor.

Total marks for this examination: 100.

The pass mark for this examination is 60 marks.

Write your answers and draw your sketches in this booklet. If you need more paper, use pages 22-25 at the back of this booklet. Clearly write the question number(s) if any of these pages are used.

All working in calculations must be shown.

### Candidates are permitted to use the following in this examination:

Drawing instruments, approved calculators, document(s) provided.

Publications, Acts, Regulations, Codes of Practice, or Standards other than the ones provided are NOT permitted in the examination room.

Check that this booklet has all of 25 pages in the correct order and that none of these pages is blank.

**YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION**

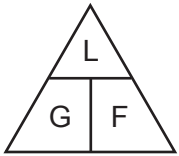
Candidates that sat this examination in June 2018 were provided with the following documents:

- NZBC clause E2: External Moisture
- AS/NZS 3500 Part 2: Sanitary plumbing and drainage

## USEFUL FORMULAE

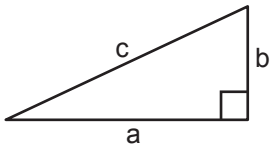
Circumference of circle =  $2 \times \pi \times R$  or Circumference of circle =  $\pi \times D$

Area of circle =  $\pi \times R^2$  or Area of circle =  $0.7854 \times D^2$



length = L  
gradient = 1:G  
fall = F

Volume of cylinder =  $\pi \times R^2 \times H$  or Volume of cylinder =  $0.7854 \times D^2 \times H$



$$a^2 + b^2 = c^2$$

Heat energy = mass  $\times$  specific heat  $\times$  temp diff

Litres of hot water  $\times$  temp diff cold to hot = litres of mixed water  $\times$  temp diff cold to mixed

Heating time =  $\frac{\text{mass of water (kg)} \times 4.2 \times \text{temp diff (}^\circ\text{C)} \times 100}{\text{heat energy input per hour in kJ} \times \text{efficiency (\%)}}$

Box's formula:  $q = \sqrt{\frac{H \times D^5}{25 \times L \times 10^5}}$

where  $q$  = quantity discharged in litres per second  
 $H$  = head in metres  
 $D$  = diameter of pipe in mm  
 $L$  = length of pipe in metres

# SECTION A

## QUESTION 1

The plan below shows the layout of sanitary fixtures for a proposed dwelling.

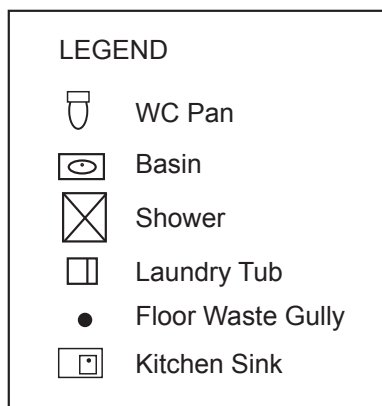
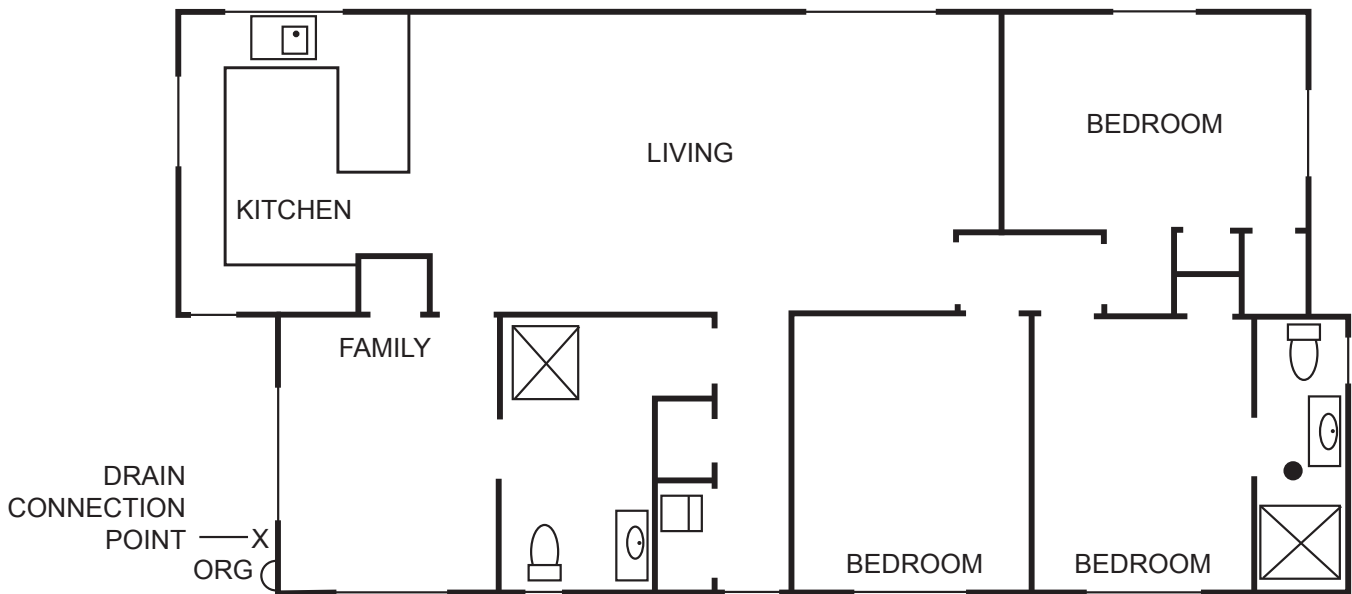
The plan is drawn to a scale of 1:100

The dwelling is to be built on a concrete pad foundation.

The drainage design for the dwelling has been completed, and the connection point for the sanitary plumbing is as shown on the plan.

The sanitary plumbing system is to comply with the minimum requirements of AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

- On the plan, draw all discharge pipes and show the location of any required vent(s).
- On the plan, show the minimum allowable diameter for each section of discharge and vent pipework.



Total 9 marks



## SECTION A

### QUESTION 1

- (a) Define the term direct supervision as it relates to supervision of a plumber under the Plumbers, Gasfitters and Drainlayers Act.

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(2 marks)

- (b) Name an authorisation type that has a mandatory direct supervision period.

---

(1 mark)

- (c) Give the minimum length of time after obtaining the authorisation in (b) that the supervisee must be directly supervised.

---

(1 mark)

- (d) Name the TWO license category holders who are permitted to carry out direct supervision of a person with the authorisation type in (b).

1 

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2 

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(2 marks)

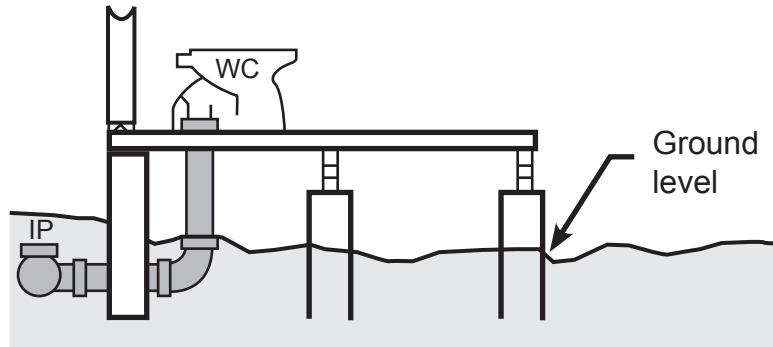
**Total 6 marks**

## QUESTION 2

Each diagram below shows the discharge pipe work between a WC pan and a foul water drain.

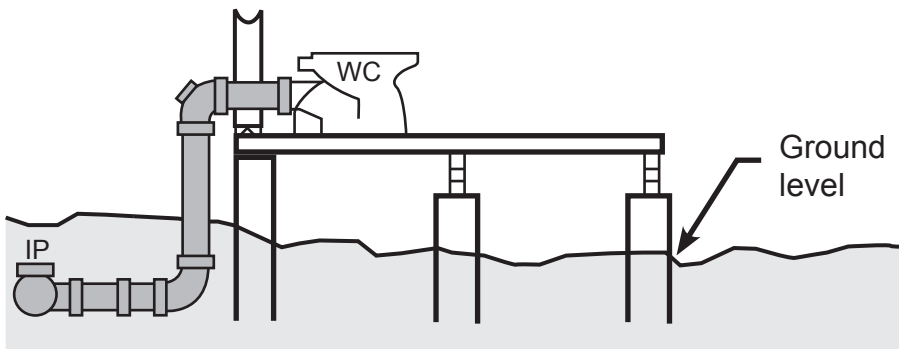
Draw a line on each diagram to show the place where the foul water discharge pipe changes from being sanitary plumbing to drainlaying.

(a)



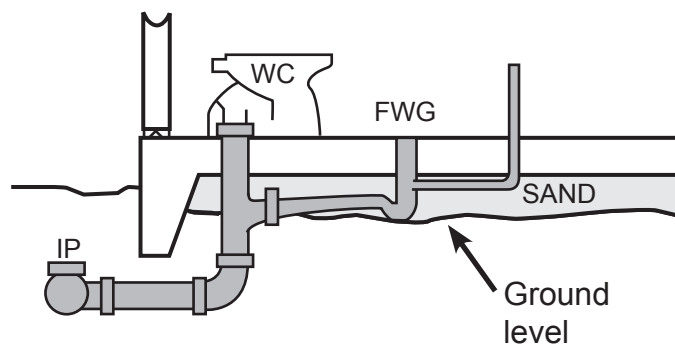
(1 mark)

(b)



(1 mark)

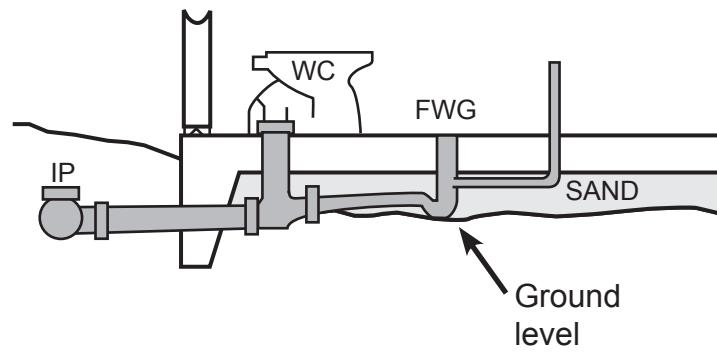
(c)



(1 mark)

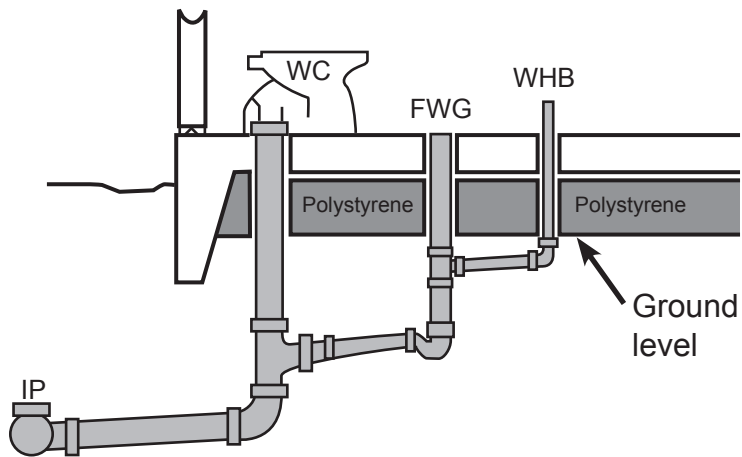
**QUESTION 2 (cont'd)**

(d)



(1 mark)

(e)



(1 mark)

**Total 5 marks**

### QUESTION 3

The diagram below shows an elevation of a cold water supply in a multi-storey building, drawn to a scale of 1:100

The water for the building is supplied from a storage tank installed on the top level of the building.

(a) State the expected water pressure at each point label A, B, and C.

A \_\_\_\_\_

B \_\_\_\_\_

C \_\_\_\_\_

(3 marks)

(b) Specialist fixtures are to be installed in the building.

The fixtures have a maximum pressure rating of 80 kPa.

Break tanks are to be used to regulate the pressure throughout the building.

(i) The minimum required number of break tanks are to be used.

On the diagram, show the floor level(s) on which break tank(s) must be installed.

(1 mark)

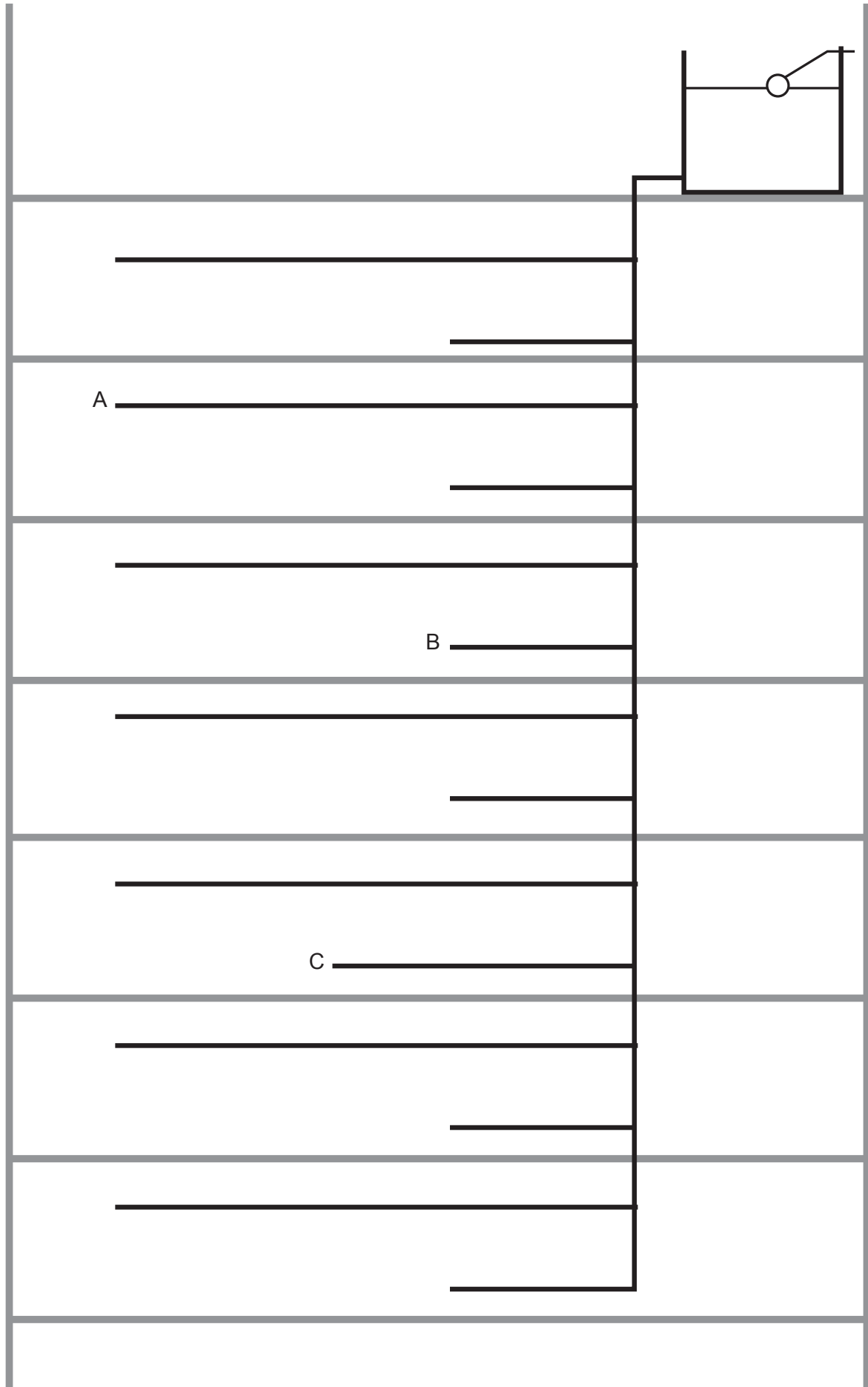
(ii) On the diagram, show how the pipework will need to be modified to connect the break tanks.

(3 marks)

**Total 7 marks**



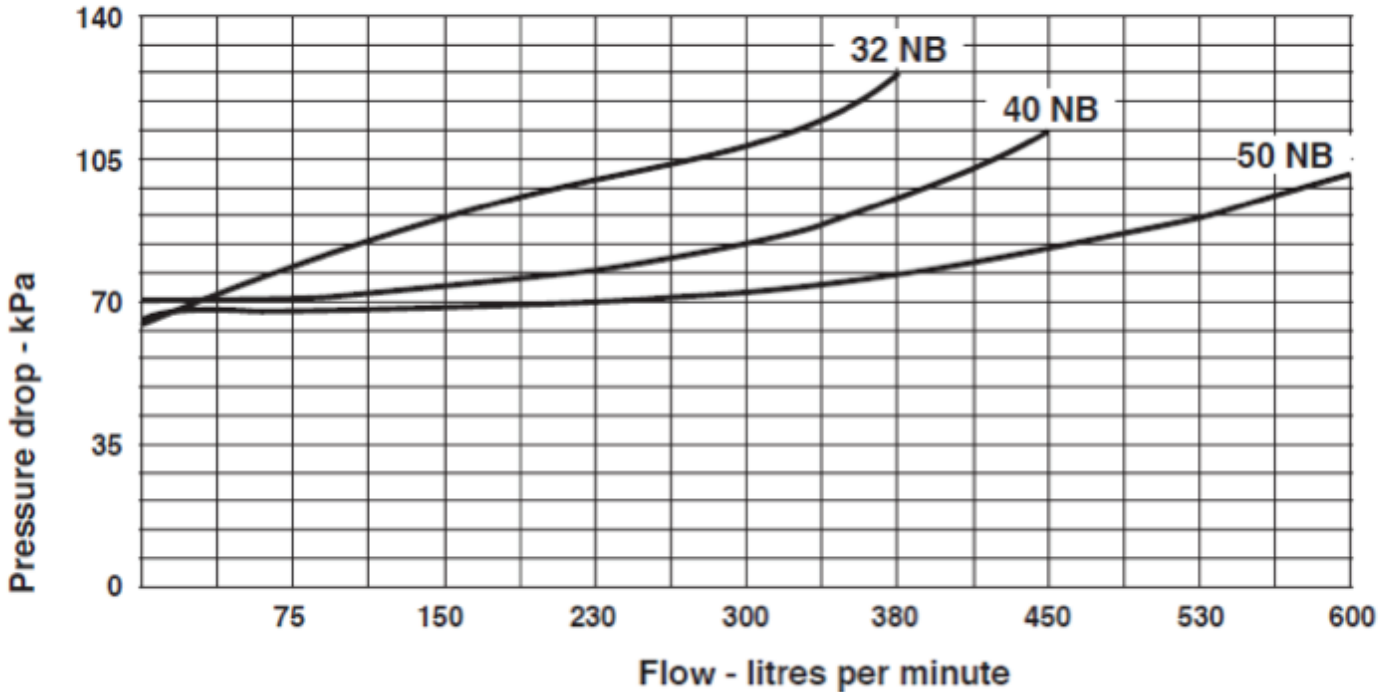
QUESTION 3 (cont'd)



**QUESTION 4**

The graph below shows the pressure drop that will occur across a reduced pressure zone backflow prevention device (RPZD) installed in a water supply for different flow rates.

**Size 32 NB, 40 NB, 50 NB.**



(a) A water supply system is required to deliver 340 litres of water per minute.

Using the graph, determine the expected pressure drop when an RPZD is installed with each diameter listed below.

(i) 32 mm NB RPZD.

---

(ii) 40 mm NB RPZD.

---

(iii) 50 mm NB RPZD.

---

(3 marks)

**QUESTION 4 (cont'd)**

- (b) A factory requires water to be supplied that gives a flow rate of 230 litres per minute at a pressure of 750 kPa at the outlets.

The supply pressure is 835 kPa.

Give the minimum diameter of the RPZD that can be installed to meet these requirements.

(1 mark)

- (c) Complete the following table by giving four different types of testable backflow prevention valve and stating the highest hazard rating installation each valve is suitable for.

Type of valve	Highest hazard rating

(6 marks)

- (d) (i) An airgap is to be used to provide backflow prevention from a storage water tank.

The water is supplied to the tank through a 32 mm diameter float valve (ball cock).

State the minimum permitted height of the airgap so that the system complies with New Zealand Building Code clause G12/AS1 Water Supplies.

(1 mark)

- (ii) State the TWO points between which the measurement in (i) is taken.

1 \_\_\_\_\_

2 \_\_\_\_\_

(2 marks)

**Total 13 marks**

**QUESTION 5**

(a) List FOUR design factors that should be considered when a solar water heating system is being planned.

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_
- 3 \_\_\_\_\_
- 4 \_\_\_\_\_

(2 marks)

(b) The starter drawing below shows three flat plate solar collector panels.

(i) There are two ways in which the panels can be connected via a manifold.

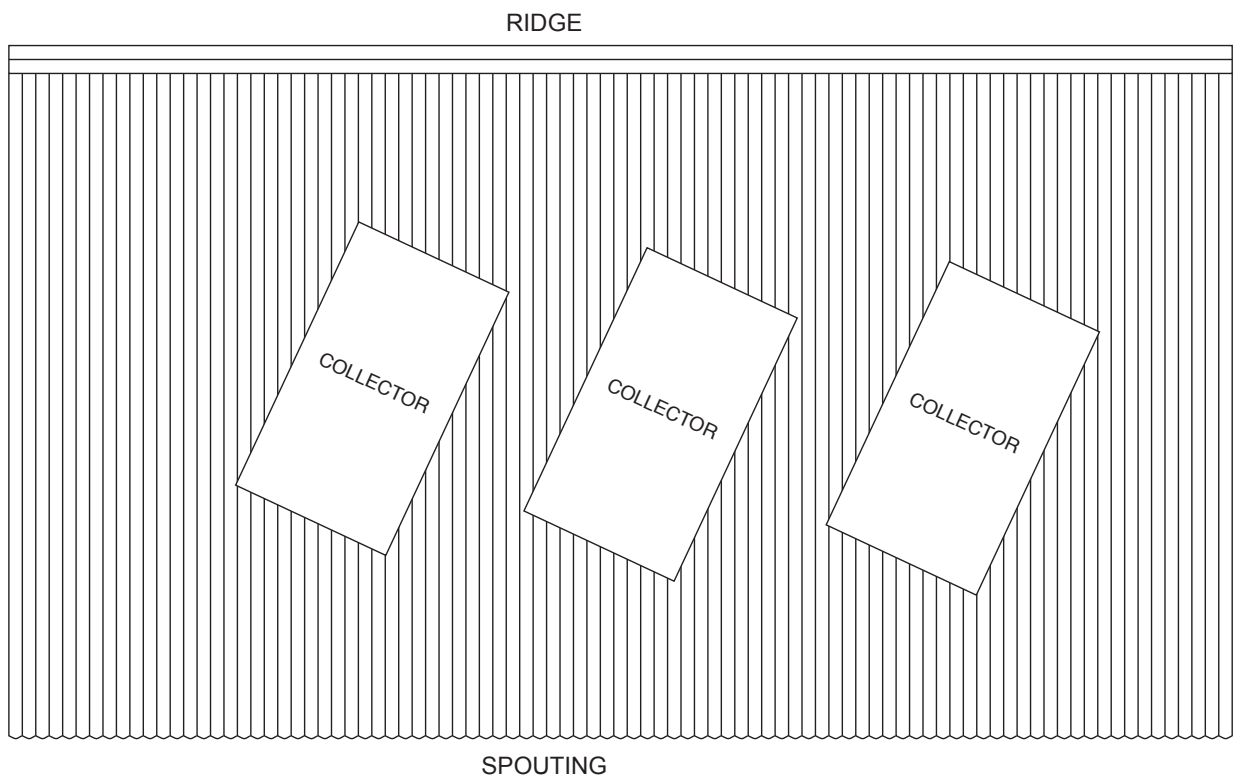
Select one of these ways, and write the name of this way below.

\_\_\_\_\_

(1 mark)

(ii) Complete the drawing to show the required pipework to manifold the panels according to the way given in (i).

On the drawing, show and label the flow and return pipework to the storage unit.



(3 marks)

**QUESTION 5 (cont'd)**

(iii) Give TWO advantages of installing solar panels using the way selected in (i).

1 \_\_\_\_\_

2 \_\_\_\_\_

(2 marks)

(c) State the factor that determines what inclination a solar panel must be installed at to operate at maximum efficiency.

\_\_\_\_\_

(1 mark)

**Total 9 marks**

**QUESTION 6**

The plan below shows a proposed dwelling and the layout of the sanitary fixtures in the dwelling.

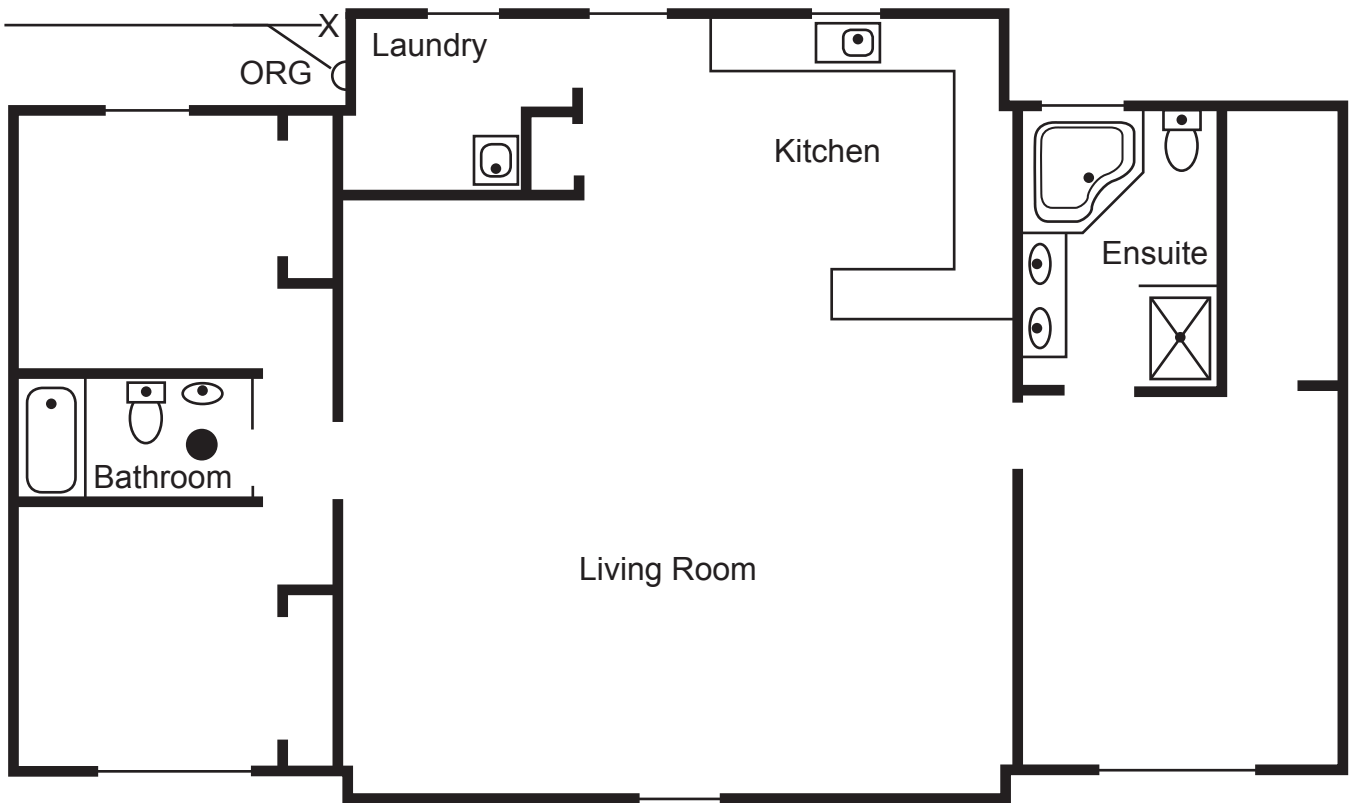
The plan is drawn to a scale of 1:100

The dwelling is to be built on a concrete pad foundation.









The drainage design for the dwelling has been completed, and the connection point X for the sanitary plumbing is as shown on the plan.

The sanitary plumbing system is to comply with the minimum requirements of AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

- (a) On the plan, draw all the required pre-slab discharge pipes and show the location of any required vent(s).
- (b) On the plan, show the minimum allowable diameter for each section of discharge and vent pipework.



**LEGEND**

 Bath	 Bath	 Vanity	 Basin	 WC	 FWG
			 Shower	 Sink	 Tub

**Total 9 marks**

## QUESTION 7

- (a) Complete the following table by giving the minimum allowable diameter for a discharge pipe connected to each fixture listed.

Fixture	Minimum Pipe Diameter
Basin	
Domestic kitchen sink with waste disposal	
Floor waste gully	
Drinking fountain	

(2 marks)

- (b) Calculate the minimum fall, in millimetres, required for a 6 metre length of 80 mm discharge pipe connected to a floor waste gully.

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(2 marks)

**Total 4 marks**

**QUESTION 8**

(a) Give SIX construction related products that could contain asbestos.

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_
- 3 \_\_\_\_\_
- 4 \_\_\_\_\_
- 5 \_\_\_\_\_
- 6 \_\_\_\_\_

(3 marks)

(b) Give the TWO terms that are used to categorise asbestos.

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_

(2 marks)

(c) Excluding asbestos, name TWO other work related hazards common to plumbing that can slowly damage a plumber's health.

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_

(2 marks)

**Total 7 marks**



## QUESTION 9

- (a) Give THREE examples of positions within a company that would be considered Officers and so responsible for ensuring that PCBU (persons conducting a business or undertaking) meet their health and safety responsibilities.

1 \_\_\_\_\_

2 \_\_\_\_\_

3 \_\_\_\_\_

(3 marks)

- (b) Some work is categorised as particular hazardous work.

Give THREE examples of construction work that would fall into this category.

1 \_\_\_\_\_

2 \_\_\_\_\_

3 \_\_\_\_\_

(3 marks)

- (c) A PCBU is to undertake some particular hazardous work.

- (i) State who the PCBU must notify before the work starts.

\_\_\_\_\_

(1 mark)

- (ii) State how much notice must be given before the work starts.

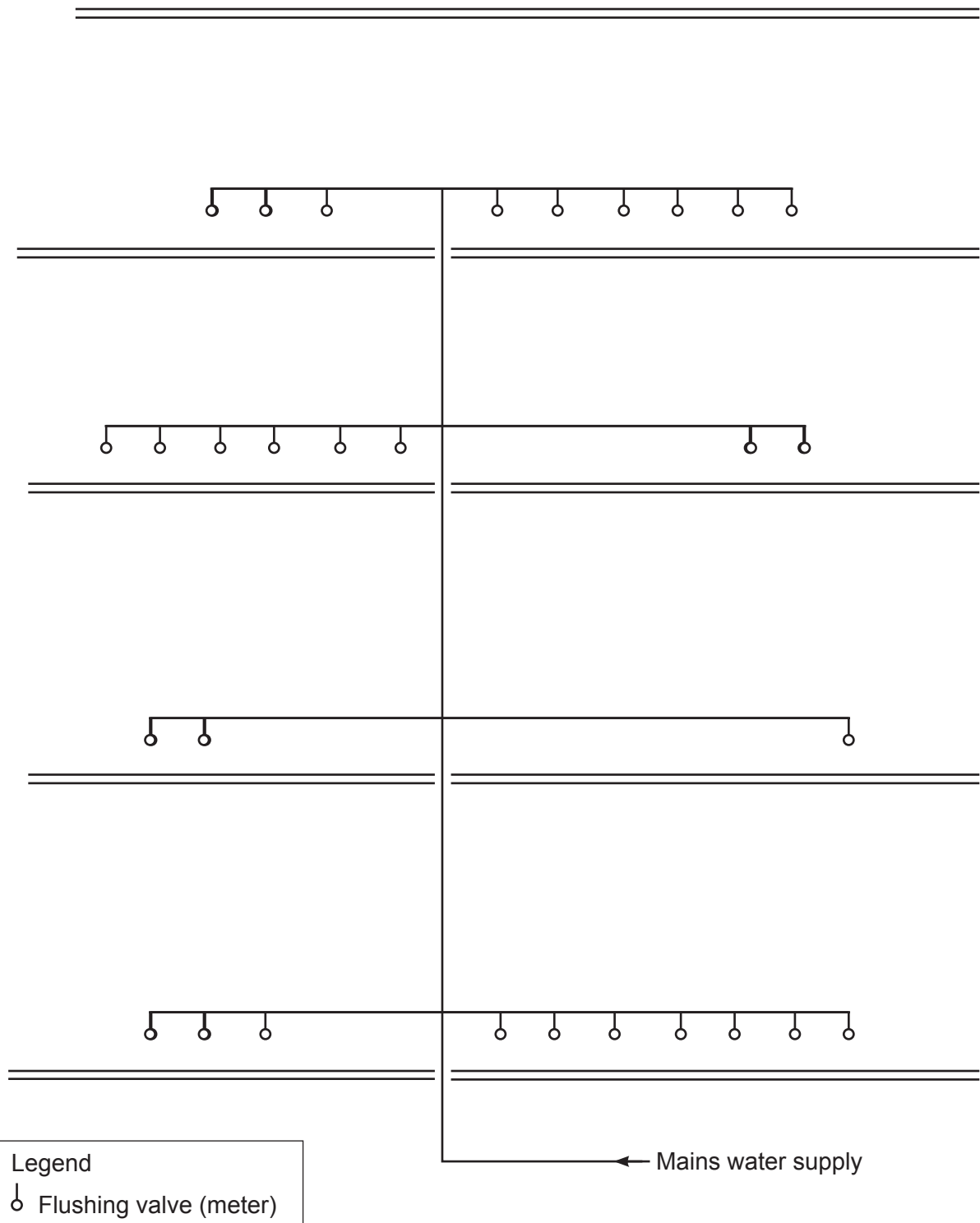
\_\_\_\_\_

(1 mark)

**Total 8 marks**

### QUESTION 10

The schematic drawing below shows the layout of flushing valves (meters) in a four story building. The flushing valves are supplied directly from a mains pressure water supply.



### QUESTION 10 (cont'd)

Using the table below, size the pipework feeding the flushing valves. Write your answers on the schematic drawing, showing the minimum pipe sizes required.

Number of valves	Pipe size (mm)
1	25
2 – 3	32
4 – 12	40
13 – 24	50
25 – 50	60

Total 10 marks

## QUESTION 11

Define each of the following terms as it relates to the New Zealand Building Code.

(a) Acceptable solution

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(2 marks)

(b) Verification method

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(2 marks)

(c) Alternative solution

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(2 marks)

**Total 6 marks**

## SECTION B

Answer the following multiple-choice questions by writing your answer (A, B, C, D or E) in the box provided after each one of the questions.

Each correct answer in this section of the examination is worth 1 mark.

Should your choice of answer be unclear no mark will be awarded.

1. What is the maximum permissible pitch of a corrugated profile roof on which an EDPM rubber boot flashing can be used to seal a roof penetration?

- A 10°
- B 15°
- C 20°
- D 30°
- E 45°

2. What is the maximum diameter pipe permitted to be flashed with an EDPM rubber boot without requiring a soaker flashing in accordance with the New Zealand Building Code clause E2 External Moisture?

- A 65 mm.
- B 75 mm.
- C 85 mm.
- D 95 mm.
- E 105 mm.

3. What is the minimum period a flashing sealing a roof penetration must last in order to be compliant with the New Zealand Building Code?

- A 1 year.
- B 2 years.
- C 5 years.
- D 15 years.
- E 50 years.

4. What is the maximum discharge unit loading for a 125 mm graded discharge pipe that has been laid at a gradient of 1.65%, as stated in AS/NZS 3500 Part 2: Sanitary plumbing and drainage?

A 254

B 342

C 410

D 509

E 686

5. How many fixture units are allowed to be discharged through an 80 mm graded discharge pipe laid at a gradient of 2.50%, as stated in AS/NZS 3500 Part 2: Sanitary plumbing and drainage?

A 16

B 20

C 27

D 39

E 65

6. How many fixture units are allowed to be discharged from any one floor to a 100 mm discharge stack that serves four or more levels?

A 25

B 75

C 100

D 125

E 150

7. According to the New Zealand Building Code clause G13/AS1 Foul Water, what is the maximum permitted developed length for an unvented 40 mm individual fixture waste pipe discharging over a gully trap?

- A 2.500 metres.
- B 3.000 metres.
- C 3.500 metres.
- D 4.000 metres.
- E 4.500 metres.

8. A grease trap is to be installed in the basement of a 125 seat restaurant. What is the minimum required capacity for the grease trap that will comply with New Zealand Building Code clause G13/AS2 Foul Water?

- A 250 litres.
- B 375 litres.
- C 500 litres.
- D 625 litres.
- E 750 litres.

9. Why is it not permitted to install two commercial sinks that share a single 50 mm water trap?

- A In the event of a waste pipe blockage, dirty water from one sink could contaminate clean water in the other.
- B The total discharge units will exceed the number permitted.
- C If the waste pipe blocked, neither sink could be drained.
- D The temperature of the waste from a commercial sink can exceed 60°C.
- E The grease content in commercial kitchen sink wastes is high and can often cause blockages.

10. Which of the following requires the restricted zone at the base of a stack to be increased?
- A When the discharge from connected fixtures is expected to be foamy.
  - B When the stack is 150 mm diameter or larger.
  - C When the stack receives 200 discharge units per floor.
  - D When the discharge stack is less than 80 mm in diameter.
  - E When an overflow relief gully is installed.

11. What is the maximum permitted length for an untrapped fixture discharge pipe that is connected to a floor waste gully?
- A 1200 mm.
  - B 1800 mm.
  - C 2000 mm.
  - D 2500 mm.
  - E 3000 mm.

12. How is the fixture unit rating of a floor waste gully determined?
- A The length of the discharge pipe from the gully to the drain or stack.
  - B The sum of the unit ratings of the fixtures discharging into the floor waste gully.
  - C The inlet size of the floor waste gully.
  - D The number fixtures discharging into the floor waste gully.
  - E The outlet size of the floor waste gully.

14. A floor waste gully is receiving the waste from a basin, bath and single head shower. What is the fixture unit rating of the floor waste gully?

- A 4
- B 5
- C 6
- D 7
- E 8



14. Which of the following is permitted to discharge into a floor waste gully located in an adjacent room?

- A Drinking fountain.
- B Kitchen sink.
- C Laundry tub.
- D Shower.
- E Tundish.

15. A sanitary plumbing discharge system is being vacuum tested for soundness.

How many kPa can the pressure drop during the allocated test time before the pipework has failed the test?

- A 3
- B 5
- C 8
- D 10
- E 15

16. An air pressure test is being used to check a 100 mm diameter sanitary plumbing discharge system 120 metres in length.

What is the minimum length of time required for the test?

- A 2 minutes stabilisation followed by a 3 minute test.
- B 2 minutes stabilisation followed by a 5 minute test.
- C 3 minutes stabilisation followed by a 2 minute test.
- D 3 minutes stabilisation followed by a 6 minute test.
- E 3 minutes stabilisation followed by a 10 minute test.

**Total 16 marks**

For Examiner's use only

Question number	Marks	Marks
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
Section B		
Total		